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WATER AND SECURITY IN THE JORDAN BASIN

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A THESIS

in

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## Water and Security in the Jordan Basin

### Introduction

What is the relationship between scarce international water resources and security in the Jordan River basin and what are its implications for conflict?

The importance of the water problem in the Middle East is that in a region already divided by religious, nationalistic, and ethnic strife and already burdened by rapid population growth and limited resources, demand has exceeded supply of the critical resource of water. This could result first in destabilization of specific regimes and then in regional warfare for the control of available water resources.

My objective is to use the case study of water related conflict in the Jordan basin to construct a model for examining water related conflicts which can then be applied throughout the Middle East.

My hypothesis is that water, because it is so essential, can be made to promote accommodation. The model I will construct will help demonstrate that a regional accommodation can be made which will be in the best interests of all parties and which can satisfy the legitimate security concerns of each of the actors. I will attempt to prove the following primary and secondary

assumptions:

Israel can be convinced either by incentives or pressure that regional cooperation on water issues is in its best interests. These incentives and pressures need not and probably cannot come solely or primarily from the Arab riparians. The role of the United States is critical. In proving this assumption, I will have to take into account the following factors: Israel's status as a regional superpower; her position as an upper riparian state; the fact that she currently uses all of the available waters from the Jordan; and the fact that she controls the sources of the Jordan including the Golan Heights and southern Lebanon. The advantages which Israel currently enjoys lead to one obvious question: Why should Israel give up the status quo? A second question is equally important: What can the Arabs or the United States do to influence Israel?

A second key assumption is that the other actors in the basin will cooperate with Israel on this issue and that other actors outside the basin such as Iraq or Libya will not act as "spoilers" to prevent this cooperation.

Additional assumptions are that:

a) Sufficient economic aid can be made available from the international community to increase efficiency of

water use in the region: money for large scale conversion to drip agriculture, construction and maintenance of desalination facilities, movement from agriculture to light industry. If the World Bank was to provide aid, it would first require a basin wide agreement.

b) Reliable agricultural exporters can be identified to provide food for the regional market in light of decreased regional food production resulting from reduction in irrigated agriculture.

c) A restructuring of the basin-wide economy can be made practical. What can the riparians do in lieu of agriculture in particular to provide employment?

Why should Israel change? Since the major stumbling block to any basin-wide settlement is Israel's military and political dominance, my approach will be to construct a framework which will demonstrate that, in the long run, regional cooperation will benefit Israel more than continued dominance of basin-wide water resources which keeps tensions high and produces a constant potential for conflict.

I will use statistical data to establish, as precisely as possible, the total potential water resources available to the basin riparians in relation to total water consumption based on national development plans and

population growth. The practicality of the model which I will construct will depend to a large extent on the technical aspects of developing water resources (in particular, desalination) and improving water conservation (in particular with regard to agriculture). Another important issue will be financing of development projects as one of the incentives to coax Israel into cooperation.

From a security standpoint, Israel has three main options with regard to securing adequate water resources on its own. One possibility is to purchase out-of-basin water. Whatever method used to transport the water to Israel (such as medusa bags or pipelines) would, however, be a security weakness. However, treaties for the use of pipelines across the territory of other states could work to promote accommodation as part of an overall settlement. Another issue would be willingness of these countries to sell this key resource to Israel. A second possibility is further use of military force to secure additional sources such as the Awali, the Litani, or the Yarmuk. This risks further international condemnation, possible political and economic pressure from the United States, and the possibility of war with the Arab states. A third possibility is to restructure the economy away from self-sufficiency in agriculture and towards light industry and



services. This risks widespread internal ideological and political opposition and would require massive economic assistance in the short term. Who would provide this assistance? This would also leave Israel vulnerable to the extent that it would be dependent on foreign food producers. However, as long as Israel can pay there will always be nations ready to sell.

I will attempt to design the model for a basin-wide authority with real control of water resources. This authority should be charged with determining an equitable, not necessarily an equal, distribution of water resources. I must first determine if any such regional authority exists in any other region and then determine if it is a viable model for this particular situation. Key questions are: Would the Arabs (or the Israelis) agree to Israeli (or Arab) membership on or even control of this authority? Would both sides agree to neutrals as members? Is the United Nations a possibility?

I must also consider the legal position of each of the riparians. What is the best legal position for my solution?

## Chapter 1

### Hydrological Parameters

The main water resources which will enter into this study are the following: the Jordan River system, the Litani River, and the aquifers of the West Bank. Other water resources which will play a key role in providing a solution to the water-related security problems of the riparians of the Jordan River are the Euphrates River, the Orontes River, the Lebanese aquifers of the Bekaa Valley and the Akkar Plain, and the Syrian aquifers.

I will first lay out the specific water resources in the region, then present and future requirements including such factors as population growth rate, and finally, how the various riparians currently manage their water resources.

#### Syria

Syria has, by far, the most water resources of the basin riparians including several rivers. The largest and most important is, of course, the Euphrates which flows for 675 kilometers through Syria and has an average discharge of  $830 \text{ m}^3$  per second. According to Clawson, the Syrians divert an average of 3,500 mcm annually from the Euphrates.<sup>1</sup> Other rivers of importance to Syria are the

Orontes, the Khabour, and the Yarmuk. According to the United Nations' study, Ground Water in the Eastern Mediterranean and Western Asia, the total annual flow of all the perennial rivers is 30,000 mcm.<sup>2</sup>

Ground water in Syria has an average annual recharge of about 5,000 mcm. The most important ground water sources are the Ras El-Ein in the northern plains with an average annual discharge of 1,450 mcm; the Ghab in the western mountain ranges with an average annual discharge of 800 mcm; the Damascus in the Syrian steppe with an average annual discharge of 518 mcm, and the coastal area of the western mountain ranges with an average annual discharge of 375 mcm.<sup>3</sup>

Syria's annual water requirements totaled 3,438.3 mcm in 1976. Of that total, requirements for irrigation amounted to 3,237 mcm and requirements for municipal and industrial use equaled 201.3 mcm. Projected annual needs for 1985 had increased to a total of 6,962.2 mcm - 6,437 mcm for agriculture and 525.2 mcm for municipal and industrial use.<sup>4</sup> According to Clawson, Syria has plans to increase its use of Euphrates waters alone to 7,590 mcm annually.<sup>5</sup>

Table 1.1

Major Rivers of Syria

River	Discharge		Avg	Total Length	Length in the Syrian Catchment		Area (km <sup>2</sup> )
	(m <sup>3</sup> /sec)				Arab Republic (km)		
	Min	Max					
Euphrates	250	2,500	830	2,230	675	350,000	
Yarmouk	7	100	15	57	47	76,990	
Orontes	10	400	. . .	571	325	. . .	
Khabour	35	300	52	460	. . .	31,800	

Source: United Nations.<sup>6</sup>

Table 1.2

<u>Ground-water region</u>	<u>Ground-water area</u>	<u>Average Annual recharge</u>	<u>Average Annual discharge</u>
		(millions of $m^3$ )	(millions of $m^3$ )
Northern plains	Radd	350	65
	Ras El-Ein	1,640	1,450
	Tel Abiad		
	Halab		334
Hauran Volcanic plateau		314	
Syrian steppe	Damascus	501	518
	Dawwa		
	Jebel Abdel Aziz	75	60
	Badiet-El-Jezireh	15	
	Badiet-Esh-Sham		

Western mountain	Ghab	. . .	800
ranges	Edleb	. . .	66
	Coastal	. . .	375
	Plains off-shore	. . .	. . .
	Submarine springs	. . .	. . ."
-----			
Source: United Nations. <sup>7</sup>			
-----			

## Lebanon

Lebanon also has substantial water resources. The most important rivers are the Orontes with an average annual flow of 416 mcm<sup>8</sup> and the Litani with an average annual flow of 650 mcm as measured at the al-Khardale Dam.<sup>9</sup> Other rivers include the Kabir, which forms part of the boundary with Syria; the Barid; the Abu Ali; the Jawzah, the Ibrahim, the Kalb, the Bayrut, the Damur, the Hasbani; the Awali, and the Zahrani.<sup>10</sup>

Lebanon also has significant aquifers which, if fully exploited, could provide 111 mcm annually.<sup>11</sup> These aquifers include a Middle Cretaceous formation in the Lebanon range which has yet to be fully exploited; a Middle Cretaceous formation in the Anti-Lebanon range which produces 6 mcm annually with plans for increasing this production to 21 mcm annually; an Eocene formation in the Lebanon range which has yet to be developed; an Eocene formation in the Anti-Lebanon range which produces 21 mcm

annually with plans for 30 mcm annually; and a Neogene-Quaternary formation in the plains which produces 36 mcm annually with a potential of 60 mcm annually.<sup>12</sup>

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Table 1.3

<u>Range</u>	<u>Springs</u>	<u>Exploitation</u>
Middle Cretaceous -Lebanon	Bordaouni Yammoune Ain Zarqa	"little exploited"
Middle Cretaceous -Anti-Lebanon	Anjar Labone-Ras el Ain Baalbek Chemaine	6 million m <sup>3</sup> /yr w/plans for 21 million m <sup>3</sup> /yr
Eocene-Lebanon		"little developed"
Eocene- Anti-Lebanon		21 mcm/yr w/plans for 30 mcm
Neogene-Quaternary -plain		36 mcm/yr & potentially 60 mcm

-----  
Source: United Nations.<sup>13</sup>  
-----

In addition to the aquifers listed above, there are shallow aquifers with the potential of providing 15 mcm annually. An alternative estimate based on the amount of subsurface flow required to counteract sea-water intrusion is 34 million m<sup>3</sup>.<sup>14</sup>

Table 1.4

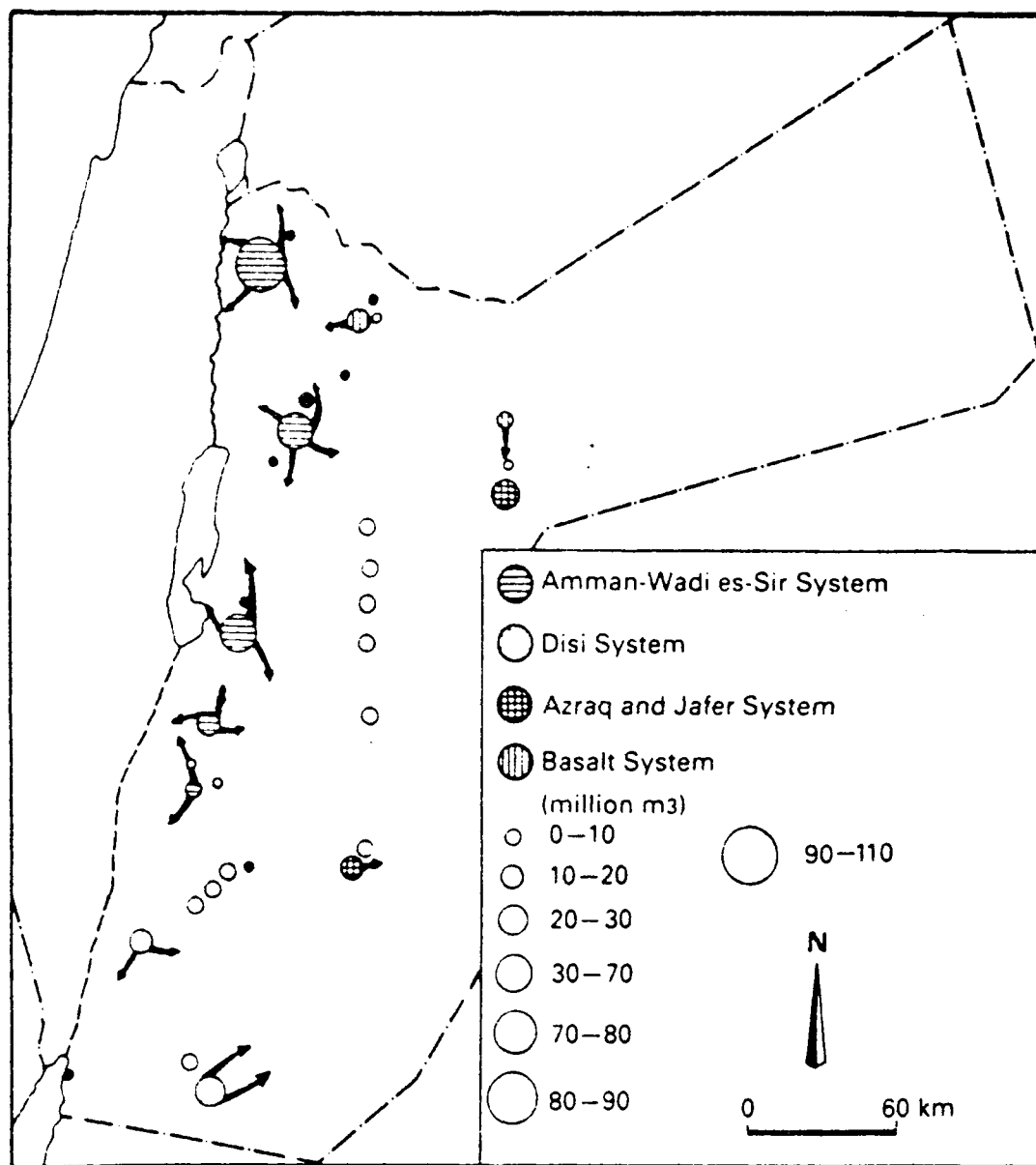
Water Resources: Jordan River and Litani River

	"Estimated average yearly flow in millions of cubic meters (m.c.m.)"
Hasbani River at proposed site of Hasbani Dam	130
Jordan River below Lake Huleh Marshes (after correcting for marsh evaporation)	640
Flow into Lake Tiberias	838
Evaporation from Lake Tiberias	300
Net outflow from Tiberias	538
Yarmuk River at junction with Jordan	475
Beisan Springs	67
Wadi Zerka	45
Other inflow below Lake Tiberias	194
Flood flows developable	163 <sup>15</sup>

Source: Clawson

Jordan

Jordan is in the worst situation with regard to water resources of all the riparians of the Jordan basin. Major rivers which flow entirely or partly within its boundaries are the Jordan, with an average flow of 500 mcm per year at the point it leaves Lake Tiberias; the Yarmuk, which has an average flow of 500 mcm per year at the point it reaches the Jordan River;<sup>16</sup> and the Zarqa with an average annual flow of 45 mcm.<sup>17</sup> Of these rivers, Jordan has full use of only the Zarqa. Jordan's surface water resources



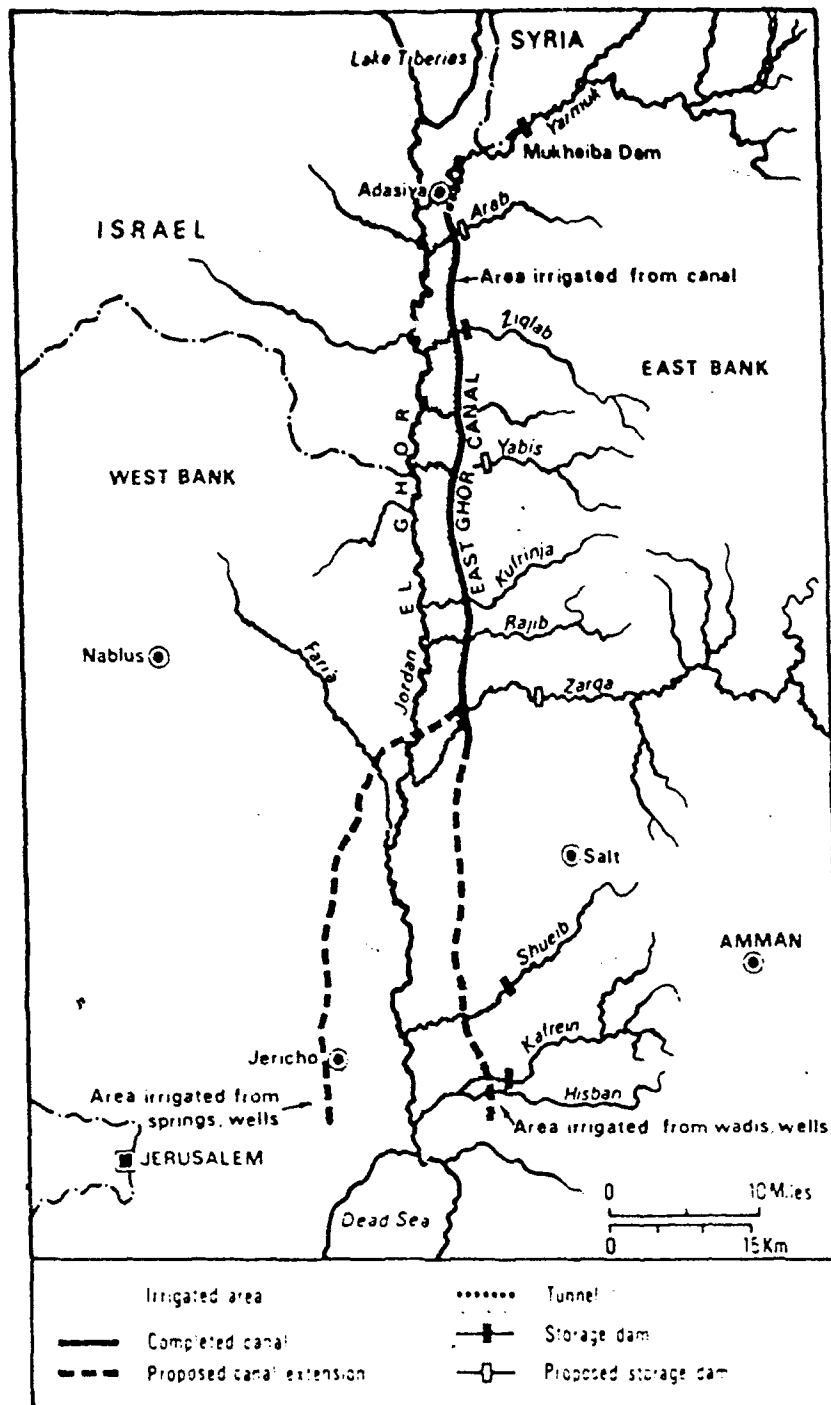
Jordanian Aquifers  
Source: Saleh



amount to 850 mcm annually while its underground water resources total only 421 mcm annually.<sup>18</sup>

The aquifer systems of Jordan include the Amman-Wadi Sir with an annual recharge of 336 mcm, a basalt aquifer in northeastern Jordan with an annual recharge of 37 mcm, the Rijam system with 27 mcm, the Hummar system with 150 mcm, the Na'ur system with 4.5 mcm, and the Disi system which receives 6.7 mcm of its recharge from Saudi Arabia and 10 mcm of its recharge from Jordan.<sup>19</sup>

It is estimated that the total amount of water which is both practically available and suitable for consumption would total 705 mcm in 1990, increasing to 820 mcm in 1995, and 934 mcm in 2000. Of these totals, agriculture would consume 553 mcm in 1990, 624 mcm in 1995, and 687 mcm in 2000.<sup>20</sup>



The Jordan Basin from Lake Tiberias to the Dead Sea  
Source: Beaumont

## Israel and the Occupied Territories

Major rivers located wholly or partly in Israel and the Occupied Territories include the Jordan, the Hasbani, the Dan, the Baniyas and the Yarmuk. The Jordan has an average annual flow of 660 mcm at the point it enters Lake Tiberias; the Hasbani, 138 mcm; the Dan, 245 mcm; the Baniyas, 121 mcm; and the Yarmuk, 500 mcm at its juncture with the Jordan River.<sup>21</sup> Israel draws approximately 600 mcm per year from the Jordan and Lake Tiberias.<sup>22</sup> Israel makes use of *all* the water of the Hasbani which enters its territory.<sup>23</sup> Regarding the Yarmuk, only 10 kilometers of which bordered the territory of pre-1967 Israel, the Israelis during those years used 23 mcm per year and "claimed an option on an additional 17 million cubic metres . . ."<sup>24</sup>

Table 1.6

RIVER FLOW

<u>RIVER</u>	<u>MCM/YR</u> <u>AVERAGE</u>	<u>VARIATIONS</u>	<u>SITE</u>
Baniyas	121	63-190	
Dan	245	173-285	
Hasbani	138	52-236	
Jordan	660		Entering Lake Tiberias
	500		Leaving Lake Tiberias
Yarmuk	500		Juncture with Jordan <sup>25</sup>

Source: Naff and Matson

Israel and the West Bank have a number of aquifers which provide significant water resources. The western Judea and Samaria aquifer flows into the Yarkon spring and the Tanninim spring resulting in a discharge of 300 mcm per year. The southern portion of the western Galilee aquifer flows into the Na'aman spring. The spring's normal production of 40 mcm has been drastically reduced due to the presence of a large number of fresh water wells. The aquifers flowing into the Yezreel-Beit Shean springs provide it with a total of about 100 mcm per year of brackish water.<sup>26</sup> The aquifers of Israel and the West Bank provide a total of 615 mcm per year. Of this total, wells in Israel itself remove 300-350 mcm per year while wells drilled for Israeli settlements in the West Bank remove another 20 mcm annually. According to Heller and

Nusseibeh, the 300-350 mcm removed by Israeli wells represents "almost 15 percent of Israel's total annual consumption of 1,900 MCM."<sup>27</sup>

Beaumont places the annual water resources of Israel at 1,800 mcm.<sup>28</sup> Included in this total is 300 mcm of reclaimed effluents, a significant proportion of the total. However, he lists no water from desalination in the table. Looking toward the future, Beaumont expects total Israeli water resources to top 2,000 mcm by the year 2000.<sup>29</sup> In this total, he includes a category called "Development of Other Sources." Whether he expects this to be the result of efforts at desalination or extraction of waters from the Yarmuk or the Litani or perhaps development of some other source is not clear. In 1980, al-Barghuthi placed the total Israeli water resources at 1810 mcm with 600 from the Jordan River, 1,000 from groundwater, 100 from Jordan River floodwaters, 100 from sewage reclamation, and 10 from desalination.<sup>30</sup>

-----  
Table 1.7

"Renewable non-saline water resources of Israel  
(million m<sup>3</sup>/year)

Fresh water resources	
Jordan River	570
Groundwater	850
Storm runoff interception	<u>80</u>
Sub-total	1,500
Reclaimed sewage effluents	300
Total	1,800

Source: Vardi, 1980<sup>31</sup>  
-----

Table 1.8

"Israel - water balance, 1977-2000

	1977	1990 (million m <sup>3</sup> /year)	2000
Supply			
Existing sources	1,565	1,495	1,495
Reclamation of sewage	30	250-90	325-425
Development of other sources	-	127	127-227
Overdraft	130	-	-
Total sources	1,725	1,872-912	1,947-2,147 <sup>32</sup>

Source: Beaumont.  
-----

In the Six-Year Plan for Agricultural Development, 1980-1985, Pohoryles places great emphasis on the use of effluents and brackish water. By the year 2000, he expects effluents to make up 30 to 40 percent of

irrigation water and brackish water to make up another 10 percent. He correctly points out that "The quality of irrigation water will gradually deteriorate due to gradual salination of the ground-water source."<sup>33</sup>

Desalination can make up part of Israel's increasing needs, but at great expense. An article in Israel Economist from 1977 projected production of 120 mcm per year of desalinated water from a nuclear dual purpose plant.<sup>34</sup> In 1983, Allen and Volgyes stated that a "dual-purpose nuclear power is in operation to desalinate seawater and produce power."<sup>35</sup> It is uncertain whether both works were referring to the same plant. In any case, 120 mcm is an important contribution to Israel's water resources, but there is doubt that desalination can make up the shortfall as Israel's demands for water increase.

Davis placed Israel's 1978 water consumption at 1590 mcm per year and stated that consumption was increasing by 15 to 20 mcm each year. He estimated that annual consumption was 80 percent agriculture, 15 percent domestic and urban consumption, and 5 percent industrial consumption.<sup>36</sup> Beaumont, using Tahal as his source, stated that non-agricultural consumption alone will increase at a higher rate than Davis projected for overall consumption.<sup>37</sup> In the Tahal study, the shortfall of

resources versus increasing consumption is made up, at least in part, by reducing the amount of water for use by agriculture. Another choice is that which the Royal Scientific Society of Jordan has raised: Israel can either make up the shortfall by taking additional water from the West Bank or it can accept the shortfall.<sup>38</sup>

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Table 1.9

PLO Estimates of Water Consumption, 1988  
(in Mcm)

	West Bank	Gaza	Israel
Consumption			
Agriculture	95	80	1,320
Domestic	27	21	325
Industry	3	2	125
Total	125	103	1,770

---

Source: PLO

Since the United Nations sees Israel as "near . . . estimated limits of exploitation on a sustained basis"<sup>39</sup> and since additional water is available in an area currently under Israeli control, further use of the West Bank aquifers by Israel is the only realistic expectation.

Of the total water assets of Israel and the Occupied Territories combined, residents of Israel receive 86



percent, Palestinians in the West Bank and Gaza receive 8 to 12 percent, and settlers in the territories receive 2 to 5 percent.<sup>40</sup> Compare these figures with the population totals of each group. Israel has 4,821,700 residents, (including 82,600 Druze, 114,700 Christians, 677,700 Moslems) while the West Bank and Gaza have 1,597,000, and there are perhaps 120,000 Israeli settlers in the territories.<sup>41</sup>

In the Gaza strip, the only source of water is groundwater. The Ministry of Agriculture in 1986 put the total annual recharge of groundwater in Gaza at 80 mcm broken down as follows: rainfall, 40 mcm; underground flows, 10-20 mcm; and flow from irrigation and cesspools, 20-30 mcm.<sup>42</sup> According to Heller, Gaza is "already overexploiting its water sources by approximately 40-50 million cubic meters a year."<sup>43</sup>

Finally, we must consider the Golan Heights. Total water sources in the Golan amount to only 7 mcm per year, but water consumption is 16 mcm per year making this area a burden on Israel's water resources.<sup>44</sup> However, since the Heights are important to Israel for security reasons, it is willing to make up the shortfall which in any case is relatively small. Nevertheless, the Israeli settlers still receive a disproportionate share of the available

water. According to Davis "the 1,900 Israeli agricultural Jewish settlers in the Golan Heights are allocated three and a half times the agricultural water quotas of the 8,900 Syrian Arab Druze village inhabitants."<sup>45</sup>

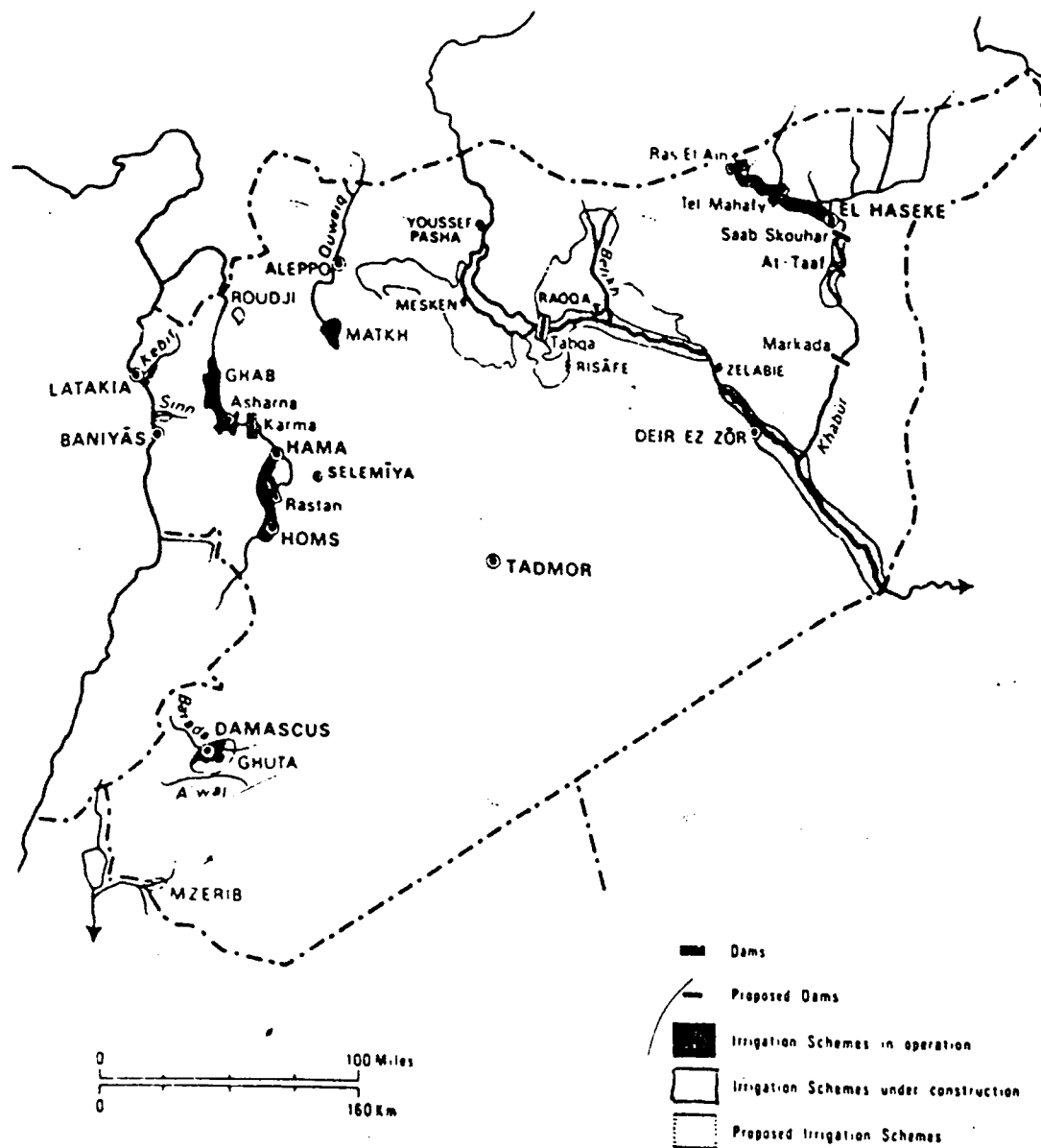
#### Water Management

With water resources so limited, especially in Israel, the Occupied Territories, and Jordan, water management becomes critical

#### Syria

The largest water development project in Syria is the Tabqa dam on the Euphrates River with a storage capacity of 11.9 km<sup>3</sup>.<sup>46</sup> Other water development projects in Syria include the Lake Homs dam improvement project and construction of a 70 kilometer built to the west of the Orontes between 1930-1944. This provides irrigation for 21,600 ha of land. Other projects included the Sinn river dam and the North Kebir river dam. Construction of a dam on the Mzerib (a tributary of the Yarmuk) and of canals on both banks provided irrigation for 3,460 ha of land. The effects of the 1967 War on this project are unknown. The Matkh floodwater diversion project (south of Aleppo) project irrigation for 14,400 ha. The Roudi project

provided for regulation of mountain streams and drainage of swamps and resulted in 3,840 ha of land being irrigated. The Khabur project included construction of a dam and a barrage which would provide irrigation for 39,000 ha of which 10,000 ha had already been irrigated by the mid-1970s. The Orontes improvement project (1954-1968) included deepening and widening of the river, a course change in one area to shift the river from a swamp area, construction of dams at Asharna, Karma, and Rastan, and irrigation of 68,000 ha.<sup>47</sup>



Syrian Water Development Projects  
Source: Beaumont

## Lebanon

Development schemes for the Litani lag due to domestic political problems.<sup>48</sup> However, major works have been completed. The Qir'awn Dam has a capacity of 200 mcm and the Khardale Dam has a capacity of 100 mcm. The Khardale is used for generation of electric power and irrigation of the coastal plain.<sup>49</sup> The development of the Litani follows a three-phase process: 1) hydroelectric power generation, 2) irrigation of 64,000 acres in the Bekaa and of 118,000 acres in South Lebanon, and 3) irrigation of the panhandle.<sup>50</sup>

Lebanon's biggest concern regarding its water resources is the fear of Israeli diversion of Litani waters. According to Halawani, "It is at al-Khardale that Israel has planned projects for diverting 400 million cubic metres of the Litani waters (that is about 60% of the total flow of the river at this point) to Israel . . ."<sup>51</sup> This action would be based on the Cotton Plan. Halawani considers it technically feasible and views the Israeli occupation of southern Lebanon as a prelude to carrying out this diversion.<sup>52</sup>

The biggest problem with carrying out this diversion is that while it is technically feasible it would require

a permanent Israeli presence in Lebanon.<sup>53</sup>

## Jordan

The major water development project completed to date by Jordan is the East Ghor project. This project involved the diversion of water from the Yarmuk to irrigate the terrace lands in the Jordan valley.<sup>54</sup> The project was built between 1958 and 1966. The canal extends south from the Yarmuk for a distance of 70 kilometers parallel to the Jordan River. The system uses gravity flow into side canals to irrigate land between the main canal and the Jordan.<sup>55</sup>

A further development of this same basic project is the Yarmuk Project. Its primary goals are to provide electricity and irrigation. Its features include:

- 1) Two dams and two power plants on the Yarmuk.
- 2) Improving the East Ghor project by constructing higher sides thereby increasing capacity and by extending the canal 40 kilometers to the Dead Sea.
- 3) Construction of a West Ghor canal connected by a siphon to a second East Bank canal parallel to the East Ghor canal.
- 4) Seven dams to regulate the flow into wadis on the East Bank.

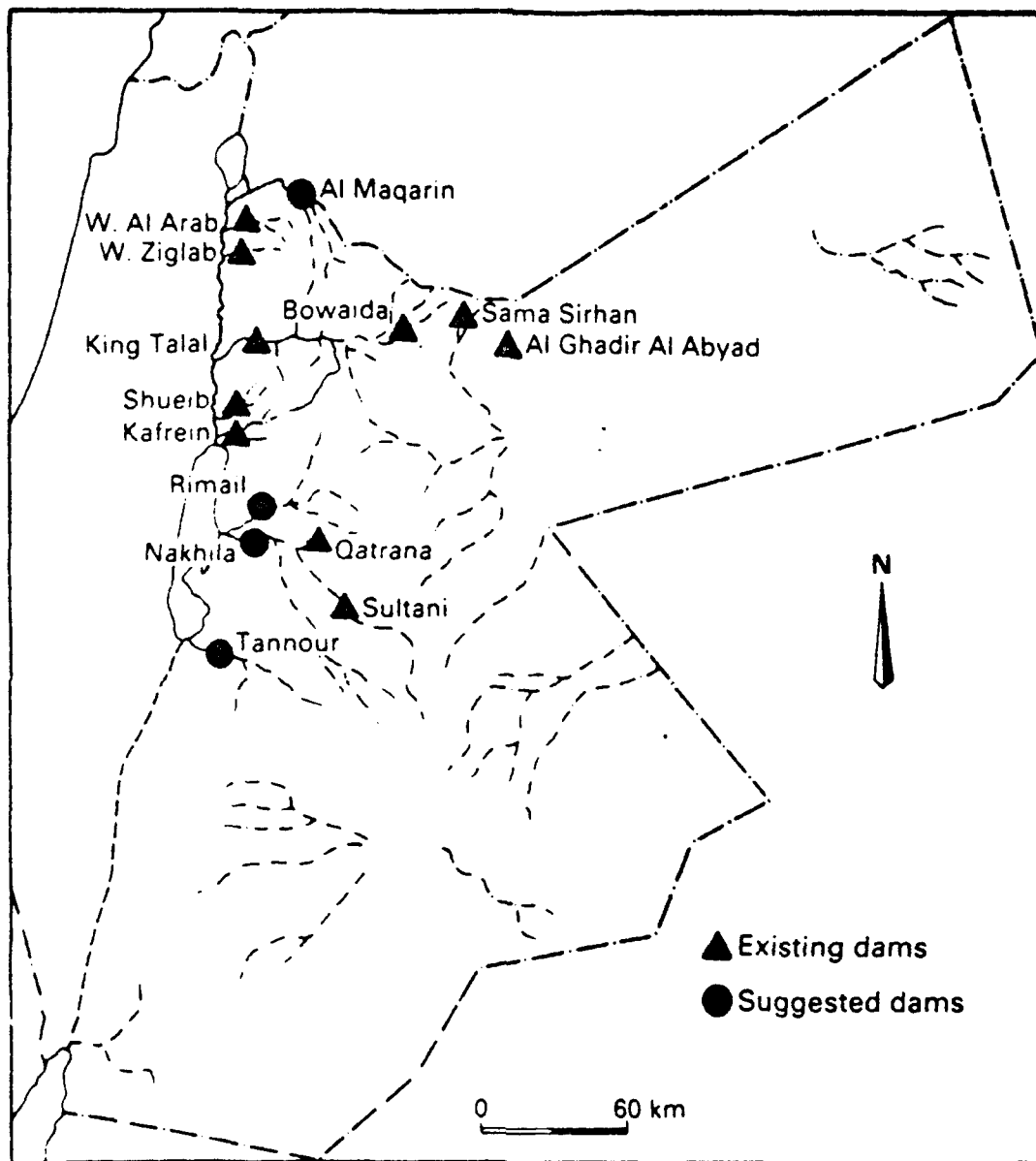
5) Construction of nine pumping stations for irrigation.

6) Land improvements including flood control and drainage.

The current status of Yarmuk Project is that the Wadi Ziqlab dam was completed in March, 1967, and the Wadi Kafrein and Wadi Shueib dams were completed in 1969. The sides of the East Ghor canal were raised. The construction of the first Yarmuk dam began in May, 1966, but was interrupted by the June, 1967, war.<sup>56</sup> This dam, the Maqarein dam (now renamed al-Wahdah, "unity," ) would, if it were ever completed, have a capacity of 250 mcm<sup>57</sup> and would be able to irrigate both the east and west banks.<sup>58</sup>

In 1977, the fourth of the dams in the wadis of the East Bank was completed - the King Talal Dam on the Zarqa River. It has a capacity of 58 mcm and can produce five megawatts of electricity.<sup>59</sup>

At present, Jordan has constructed a total of thirteen storage dams with a total capacity of 90 mcm. Plans exist to construct more dams with a total capacity of 320 mcm.<sup>60</sup>



Jordanian Dam Sites  
Source: Saleh



## Israel and the Occupied Territories

The water management system in Israel is centered around the National Water Carrier which is an aqueduct and pipeline system which carries water from the Jordan River and Lake Tiberias to the heavily populated coastal plain and from the coastal plain to the Negev. Other reservoirs, in addition to Lake Tiberias, are at Tsalmon and at Beit Netofa. The capacity of the the National Water is approximately 500 mcm per year. Other projects include the Yarqon-Negev project with a capacity of 270 mcm per year and the Western Galilee-Kishon project with a capacity of 85 mcm per year.<sup>61</sup> Pohoryles identifies the primary goals of Israeli water policy with regard to agriculture as follows:

- "1) Development of the fresh-water reserves inside and outside the green line.
- 2) Development of urban effluents, including the Dan Water Reclamation Project and other projects.
- 3) Development of saline water\* and utilization thereof in the Arava region.
- 4) Utilization of desalinated water for drinking purposes, especially in the conversion plant at Ashdod.
- 5) Installation of equipment for regulating, conveying and distribution of water.
- 6) Various activities aimed at improving water quality.

\*Containing over 1,000 milligram chlorine per liter."<sup>62</sup>

Management of West Bank water resources is, of course, in the hands of the Israeli government.

Israeli policies in the West Bank include banning the

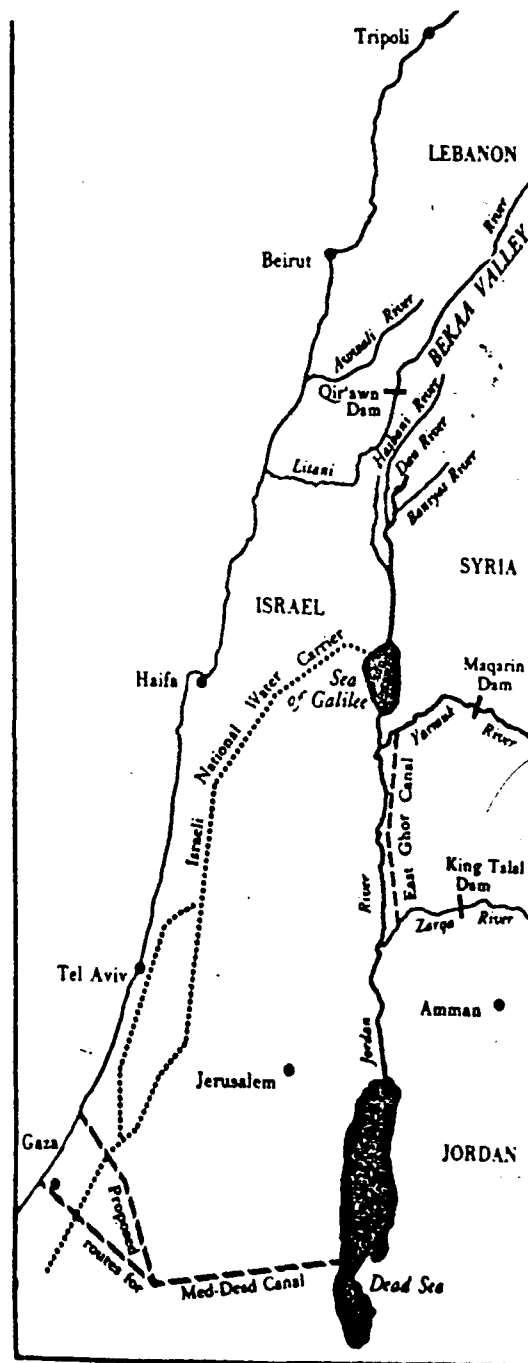
drilling of wells without Israeli permission; close supervision of Arab drilling even when permission is granted; placing limits on pumping from existing Arab wells, and providing for settlement water supplies completely from West Bank sources.<sup>63</sup>

According to Davis, Mekorot, the Israel Water Company, has

"since 1968 . . . drilled at least seventeen new wells inside the West Bank to provide for the domestic consumption and irrigation requirements of the new Jewish settlements . . .

"since the beginning of the Israeli occupation . . . no Palestinian Arab village or individual has received permission to drill a new irrigation well in the West Bank, and only seven permits have been issued since 1967 to drill wells to supply domestic water consumption . . ."<sup>64</sup>

The water situation in the West Bank has reached the point that irrigation of Palestinian lands has been crippled despite the fact that what Heller calls "the water balance" between Israel and the West Bank was heavily tilted in the West Bank's favor.<sup>65</sup> Irrigation is limited, some wells are confiscated, and the remaining wells are strictly monitored to insure a continued adequate supply of freshwater for Israeli development.<sup>66</sup>



Major Water Development Projects  
of the Jordan and the Litani  
Source: Cooley

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## Chapter 2

### Military Parameters

In dealing with water-related conflict in the Jordan basin, establishing the military parameters is just as important as establishing the hydraulic parameters. Establishing the military parameters is a two step process consisting of 1) totaling and comparing raw numbers of troops, tanks, and aircraft and 2) analyzing those factors which go beyond raw numbers in determining combat potential of a military force. Another factor which is taken into account is the past performance of the various military organizations of the opposing states, but to base judgments of the military capabilities of armies on past history without careful analysis of their current strengths and weaknesses is an unacceptable approach.

Obviously, an in depth analysis of the military capabilities of any country is an exhaustive effort beyond the scope of this chapter. Nevertheless, this attempt will provide a basic understanding of the relative strengths and weaknesses of the military forces of the Jordan basin.

In making comparisons of the military potential of the Jordan riparians, the Lebanese military will not be included due to the effects of the Lebanese Civil War.

The Lebanese army nominally consists of ten separate brigades, but these have long since fragmented and been divided among the various factions of the warring parties. In any conflict involving the Jordan riparians, the Lebanese military would not be a major factor.

Two factors which must be considered in comparing the forces of the Jordan riparians are force ratios and weapons. During the Vietnam War, the United States military developed the concept that a 3:1 ratio of attackers to defenders was needed to mount successful offensive operations. However, as Beaumont and Snyder point out the German Army in World War II "routinely fought successful actions at a disadvantageous ratio of 1:5; as long as formations involved were more or less intact and adequately equipped, and success was sometimes achieved under even more unfavorable strength ratios."<sup>1</sup>

Beaumont and Snyder also point the neglect of weapons which were "often taken for granted or treated in a very quantitative way in academic analyses of military policy and operation."<sup>2</sup> The following review of both force ratios and weapons is meant to avoid these mistakes in studying potential conflict in the Jordan basin.

The Israeli Army has a total of 130,000 regular troops versus 80,000 in the Jordanian Army and 306,000 in the

Syrian Army or a ratio of almost 3:1 in favor of the Arab riparians. This assumes that the Arab forces join in a united effort - an assumption that has only proven true once since the end of the Israeli War of Independence. Once reserves are mobilized, however, the ratio in favor of the Arabs falls to only 1.5:1. This ratio reflects only manpower and does not reflect quality or quantity of training or quality or quantity of equipment.<sup>3</sup>

A comparison of total tanks drops the ratio even further to less than 1.4:1 with total tank strengths of 1,115 for Jordan, 4,100 for Syria, and 3,810 for Israel. Since large numbers of tanks in all three armies are obsolete American, Soviet, and British models, a further comparison of the ratios of "high quality" tanks is required. In this category, Jordan has 375 tanks; Syria, 1,000; and Israel, 1,210 for a ratio of less than 1.2:1 still in favor of the Arabs.<sup>4</sup>

Since modern mechanized warfare depends on combined arms operations, consideration must be made of the total number of all armored vehicles: not just tanks, but armored personnel carriers for the infantry forces and armored reconnaissance vehicles for the reconnaissance elements required by all mechanized forces. In this overall category, Israel outnumbers the combined Syrian

and Jordanian forces: Israel has a total of 11,910 armored vehicles; Jordan, 2,680; and Syria, 7,900 for a ratio slightly in favor of the Israelis of just over 1.1:1.<sup>5</sup>

In comparing the air forces of the riparians, a similar pattern emerges: the greatest Arab advantage is in total number of active duty personnel (almost 3:1) with a smaller advantage following mobilization of reserves (almost 1.5:1). When modern equipment is considered, especially high quality equipment, the ratios improved until, for the most important categories, they favor the Israelis.<sup>6</sup>

In the category of interceptor aircraft, Syria outnumbers Israel 345 to 171 or 2:1. (Jordan has no aircraft worthy of being considered modern interceptors.) When considering high quality interceptor aircraft, however, Israel has a decided advantage of 171 to 65 or better than 2.6:1.<sup>7</sup>

When considering ground attack and multi-purpose aircraft, Israel holds the advantage in both total aircraft (440 to Syria's 305 and Jordan's 107 or less than 1.1:1) and in high quality aircraft (24 for Israel versus none for either Syria or Jordan).<sup>8</sup>

Table 2.1. Major Armies of the Jordan Basin

Country	Personnel (thousands)			Tanks		Total	APCs* & ARVs*	Guns & Mortars
	Reg.	Res.	Total	High Quality	Others			
Israel	130	365	495	1210	2600	3810	8100	1300
Jordan	80	60	140	375	740	1115	1565	600
Syria	306	300	606	1000	3100	4100	3800	2300

\*APC: Armored Personnel Carrier

\*ARV: Armored Reconnaissance Vehicle

Source: Gazit and Eytan.

Table 2.2 Major Air Forces of the Jordan Basin

Country	Personnel (thousands)			Interceptors		Strike & Multi-Role Aircraft	
	Reg.	Res.	Total	High Quality	Others	High Quality	Others
Israel	30	55	85	171	-	24	440
Jordan	9.7	-	9.7	-	-	-	107
Syria	80	37.5	117.5	65	280	-	305

Source: Gazit and Eytan.

In addition to conventional forces, Israel has another undisputed advantage over its coriparians with as many as 100 nuclear warheads.<sup>9</sup>

A number of studies have attempted to go beyond the comparison of numbers such as discussed above, but the advantage of raw numbers and the disadvantage of other factors is that these raw numbers readily lend themselves to clear comparisons while use of such factors as training, discipline, and coordination is difficult and often subjective. Factors such as number of training days per individual or per unit can be measured as well as frequency of weapons qualification for individuals and crews or the number of days of field training per year per unit, but such factors remain vague and cannot show the quality of the training involved.

Nevertheless, some other methods exist for forecasting combat effectiveness. One such method which exists at the individual level and which can be quantified is educational level.

According to Hoiberg,

"Of all variables examined as predictors of military competence during the past twenty years, it was concluded in nearly all studies that level of educational attainment correlated significantly with military effectiveness criteria."<sup>10</sup>

Although these are studies of American youth, they may

help explain, at least in part, the superiority of the Israeli military. Israel has 11 years of compulsory education from age 5 to age 16; Jordan has 10 years of compulsory education from age 6 to age 15; and Syria has only 6 years of compulsory education, age 6 to age 11.<sup>11</sup> While these few statistics cannot be considered a definitive answer, they do support the findings of studies such as Hoiberg's.

Other factors which could be studied in making comparisons of the relative military capabilities of the riparian forces include the soldiers' socioeconomic background, personality characteristics, motivation, attitudes, and expectations. All of these factors have been studied in determining the potential performance of recruits for the American military and may prove valuable in determining the expected performance of Middle Eastern soldiers.<sup>12</sup>

Finally, there is the societal as opposed to the individual factor. According to Sarkesian,

"It is . . . assumed that combat effectiveness may be more a function of such things as domestic value systems, the will to fight, ideological commitment, styles of leadership, and the degree of value accommodation, rather than technical capability and skill proficiency. In the broader sense, the demands of a liberal democratic system and a technologically advanced society, and the impact of these on individual behavior and attitudes may be the primary determinants of whether or not military units or the

military institution itself can perform their missions."<sup>13</sup>

If such factors apply to the militaries and the societies of the Jordan basin, then they reinforce the military advantages of Israel which were discussed earlier. As the most technologically advanced and the most democratic of the riparians, Israel may enjoy sociological advantages which impact directly on its military needs.



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### Chapter 3

#### Legal Issues in View of International Law

We must now consider the impact of international law on the basin conflict. There are several sources of international law.<sup>1</sup> The first source is international agreement. The second is international custom. This requires "two elements. . . a continuing practice, and the sense that the practice is a result of a legal obligation . . . the opinio juris."<sup>2</sup> The third source is general principles of law recognized by "civilized nations." This source involves matters that are "so fundamental that it must bind all states, all states are bound even if they have refused to accept the rule . . . a jus cogens."<sup>3</sup> The fourth source is basic justice and fairness, to which both parties must agree. The fifth source, authoritative opinion, is considered a secondary source.

Various approaches for settling consumptive claims for use of international water resources include absolute territorial sovereignty in which the upper riparian claims that "it is free to do whatever it chooses with the water within its borders regardless of the effects of its use on any other state."<sup>4</sup> This approach is supported by the Harmon Doctrine formulated in 1895 which is based on the

"opinion of Attorney General Harmon, asserting the United States' right to divert any waters inside its frontiers in the absence of treaty obligations."<sup>5</sup> This most closely describes the approach Israel is taking especially with regard to Jordan in its use of the Jordan waters. A second approach is absolute integrity of the river in which "Lower riparians . . . claim that they are entitled to have the river come down without change in its natural condition."<sup>6</sup> Another approach is community of property in which agreements are "tailored to meet the special needs of the particular dispute over the particular basin."<sup>7</sup> Related to the community of property approach is restricted sovereignty in which water may be allocated on the basis of historic use, need, land area, or population.<sup>8</sup> This is the approach most likely to lead to an effective solution to the Jordan basin dispute. Another approach is sic utere tuo ut alienam non laedas or "use your own so as not to cause an injury to another."<sup>9</sup> A final approach, "the Helsinki Rules," will be discussed later.

International agreements and customs which may apply include the Hague Regulations and the Geneva Conventions. These are international agreements which deal with such wartime matters as treatment of the sick and wounded and

treatment of civilians in occupied territories. The importance of these agreements with regard to the Jordan basin is that they would prohibit the consumptive uses of water from the Occupied Territories by Israel.

According to Dillman,

"The Hague Regulations IV of 1907 are accepted by most observers as representing customary international law and thus as binding on all nations. Although Israel has not signed the regulations, the Israeli High Court has accepted this consensus, holding that the Hague Regulations are binding on Israel in its occupation of the West Bank and Gaza Strip."<sup>10</sup>

Article IV of the Geneva Convention and the Hague Regulations Article IV deal specifically with treatment of civilians living in occupied territories, their individual and collective property. It has been ratified by Israel, Jordan, and Syria.

Again, according to Dillman,

"Israel claims that the convention is not applicable to the occupied territories, but its arguments have been rejected by nearly every international legal scholar, government (including the United States), and international organization (including the United Nations and the International Committee of the Red Cross)."<sup>11</sup>

The convention does not specifically refer to the "destruction" of water, but as Article 53 makes clear destruction of collective property is prohibited and few items could meet the description of collective property

like water resources could.

Article 53 of the Geneva Convention IV follows:

*"Article 53. - Prohibited Destruction*

*"Any destruction by the Occupying Power of real or personal property belonging individually or collectively to private persons, or to the State, or to other public authorities, or to social or co-operative organizations, is prohibited, except where such destruction is rendered absolutely necessary by military operations."*<sup>12</sup>

Dillman makes the argument that consumptive use of West Bank water by Israel is for all practical purposes the destruction of the water. It is difficult, if not impossible, to imagine how this use of what is clearly and effectively a Palestinian national resource could be anything other than the "destruction" of that resource. Israel is clearly in violation of the Geneva Convention and, therefore, in violation of international law.

Due to lack of effective enforcement mechanisms, international law cannot bring about a settlement of this water conflict among the various riparians, but if direct bilateral or multilateral agreements could be concluded among the parties, then international law could provide a powerful moral force in helping to maintain such agreements. The assumption here is that Israel would give more support to direct agreements concluded with its neighbors than it does to international statutes which interfere with its goals and interests.

The current situation of Israeli domination clearly calls for a change in the status quo. The Arab riparians, especially the Palestinians and the Jordanians, suffer from the lack of a basic natural resource - a resource which Israel, due to its dominance as a military power and as an upper riparian, has in relative abundance. Israel on the other hand pays the price for control of basin water with increased hostility and the military, political, and economic costs associated with that hostility. Viable substitutes for the status quo must be sought.

Because Israel is the key to a possible solution and because it is clearly the dominant player in the basin, emphasis will be placed on the Israeli viewpoint in analyzing possible solutions. Nevertheless, the viewpoints of the various Arab riparians will always be given proper consideration and the final recommendations of this paper will be balanced with regard to the needs of all the riparians.

One recommendation for a substitute for the current situation of Israeli dominance would be an agreement which stipulates the management of the Jordan basin as a single unit under the authority of an effective basin-wide council. This council could be composed solely of

representatives of the riparian states, or an international body, or a combination of the two.

The following discussion is intended to set forth the arguments in favor of both treating the basin as a single unit and of the effectiveness of a single management council.

Currently, the Jordan basin is being administered piecemeal. In place of peaceful cooperation, the basin is dominated by Israeli military might. The result for the Arabs is the loss of water resources. The result for the Israelis is an additional factor contributing to continued regional tension and the waste of other resources to support continued militarization. It must be pointed out, however, that Israel currently benefits by the gain of water resources which would normally go to its neighbors. In Cooley's words, "While the need for a rational, overall water-sharing scheme steadily grows more apparent, it seems less attainable, as water issues are aggravated by political tensions."<sup>13</sup>

Jessica Tuchman Mathews is overly optimistic when she writes that "our accepted definition of the limits of national sovereignty as coinciding with national borders is obsolete," but she is on much firmer ground when she claims that "environmental problems demand regional

solutions which encroach upon what we now think of as the prerogatives of national governments."<sup>14</sup>

This viewpoint represents the kind of thinking that is needed for the riparians of the Jordan basin to reach a basinwide settlement of the water issue within or without the overall framework of a comprehensive peace settlement. They must be shown, however, that the benefits of change outweigh the benefits of the status quo. Demonstrating the usefulness and effectiveness of a basinwide or international commission to administer the waters of the basin is a vital step.

International legal bodies have frequently called for both treating international rivers as single units and for creation of management councils with varying degrees of authority over the resources of international rivers. In 1911, the Institute of International Law devised the Madrid Declaration with "a recommendation to appoint permanent joint commissions as advisory or decision-making bodies."<sup>15</sup> The International Law Association stated at its Dubrovnik Conference in 1956 that:

"So far as possible, riparian states should join with each other to make full utilization of the waters of a river, both from the viewpoint of the widest variety of uses of the water, so as to assure the greatest benefit to all."<sup>16</sup>

At its New York Conference in 1958, the Association



stated: "A system of rivers and lakes in a drainage basin should be treated as an integrated whole (and not piecemeal)."<sup>17</sup> In 1966, the Association adopted the Helsinki Rules which state that "each basin state is entitled, within its territory, to a reasonable and equitable share in the beneficial uses of the waters of an international drainage basin."<sup>18</sup> It must be pointed out here that equitable does not necessarily mean equal. Factors such as population, level of development, and availability of other water resources must be considered in deciding what is "equitable."

Before attempting to reach agreement on shared water resources, nations must first agree within the context of international law on a reasonable definition of an international body of water. The Institute of International Law, meeting in Salzburg in 1961 adopted the following resolutions:

"The present rules and recommendations are applicable to the utilization of waters which form part of a watercourse or hydrographic basin which extends over the territory of two or more states."

and

"It also recommended in Article 6 the desirability of creating common organs to establish plans for the utilization of particular basins."<sup>19</sup>

A United Nations panel meeting in 1957 on "the

economic and social implications of the integrated river basin" stated:

"It is now widely recognized that individual water projects - - whether single or multipurpose - - cannot as a rule be undertaken with optimum benefit for the people affected before there is at least the broad outlines of a plan for the entire drainage area."<sup>20</sup>

For a Jordan basin model, consideration should be given to certain aspects of two agreements currently in effect between neighboring riparians. These are the United States - Mexico Treaty of 1944 and the Nile Agreement of 1959 between Egypt and Sudan.

The United States - Mexico Treaty covered both the Rio Grande and the Colorado rivers. It created a "scale of priorities" for water use which were, in order: domestic and municipal uses, agriculture, power and industrial uses, navigation, and fishing. Construction of dams and reservoirs were including in the agreement with payment of cost "in proportion to benefits received."<sup>21</sup> A joint committee was charged with implementation of the treaty - the International Boundary and Water Commission, United States and Mexico. A protocol was signed which:

". . . redefined the Commission's jurisdiction as extending to all works along the boundary line and to those constructed exclusively for the discharge of the treaty, whereas those

constructed only partly for the performance of the treaty inside either country were to be under federal agencies. The protocol was made an integral part of the treaty."<sup>22</sup>

The Nile Agreement of 1959 provided for coordination between Egypt and Sudan on development and construction projects. It also set a specific standard for distribution of Nile waters. The Agreement

"guaranteed 48 billion cubic meters annually, measured at Aswan, to the United Arab Republic and 4 billion to the Sudan . . . If the annual flow did not exceed 84 billion cubic meters, the surplus of 22 billion (allowing for a loss of 10 billion through evaporation) was to be divided between the two republics at the ratio of 14.5 for the Sudan to 7.5 for the United Arab Republic. If the annual flow was in excess of 84 billion cubic meters, the additional surplus was to be divided equally between the two parties . . ."<sup>23</sup>

In the event that the several other Nile riparians pressed their claims to the waters of the Nile, the treaty included a joint plan for dealing with the issue:

"both Republics agree to study together these claims and adopt a unified view thereon. If such studies result in the possibility of allotting an amount of the Nile water to one or the other of these territories, then the value of this amount as at Aswan shall be reduced in equal shares from the share of each of the two Republics."<sup>24</sup>

Nevertheless, it is Teclaff's view that extensive use by the upper riparians would inevitably lead to the necessity of writing a new treaty. Despite this, however, the current Nile Agreement is an excellent example of

cooperation between upper and lower riparians of vastly different military, political, and diplomatic strengths. For this reason alone, it serves as an excellent tool for working on the problems of the Jordan basin.

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## Chapter 4

### Principle Issues

#### Israeli Dominance

The first key issue which must be discussed is Israeli control of a priceless resource through military and political dominance. Militarily, there is no Arab country or combination of Arab countries which can currently match Israel. The Arab countries within the Jordan basin have no hope in the foreseeable future of regaining control of the waters of the basin through military action. The Lebanese Army has yet to reestablish its authority over vast segments of its own territory. The Jordanians, perhaps the best of the Arab armies on organizational and individual levels, are no match for the Israelis in proficiency and are greatly outmatched by the Israelis in quantity and quality of armor and aircraft. The Syrians have an edge over the Israelis in quantity of tanks, but the Israelis have always been able to overcome this advantage due to a slight edge in the quality of its armor and, more importantly, by vastly superior battlefield vehicle recovery and maintenance and combined arms tactics.

Politically, the Israelis have been able to out-

maneuver the Arab states which oppose her. While the Arab states have held the edge over Israel in forums such as the United Nations General Assembly and the Nonaligned Movement, Israel has held the edge in more effective forums such as the United Nations Security Council, where it has been backed by the veto of the United States, and in western Europe. The two major factors in Israel's political and diplomatic successes have been the support of the United States, especially since the October War, and the disunity of the Arab camp.

The support of the United States is well documented. Israel is currently, and has been for a number of years, the largest recipient of United States foreign aid. From the establishment of the state of Israel through 1985, the United States provided Israel with \$31,305,300,000. To put this in perspective, during the same period the United States provided the Republic of Korea with a total of \$14,679,800,000 and the Republic of Vietnam with \$23,364,000,000 in military and economic assistance. As of 1988, Israel was receiving a total of \$8.2 to \$8.5 billion a year from the United States in both public and private aid through a combination of grants, loans, investments, and and special privileges.<sup>1</sup>

With regard to Arab disunity, the Persian Gulf War is



perhaps the best example. One Arab country invaded another and soon afterward key Arab countries joined Israel's patron, the United States, in a coalition against Israel's fiercest enemy, Iraq. Of the Arab states linked to the Jordan basin, Lebanon was not a factor in the war; Syria joined the coalition against her old enemy, Iraq; the Palestinians were firmly in favor of Iraq, and Jordan attempted to walk a tightrope between her obvious support for Iraq and her desire for continued good relations with the United States.

Israel has taken advantage of both western support and Arab disunity to maintain her dominant position in the region, especially in the Jordan basin.

Next, consideration must be given to how Israel controls and manages the waters of the Jordan basin. As a result of the Six Day War, Israel captured the Baniyas River.<sup>2</sup> At the same time, Israel, which previously had controlled only a 10 kilometer stretch of the Yarmuk, now controlled half the length of the Yarmuk allowing greater Israeli interference with Jordanian efforts to utilize its waters.<sup>3</sup> Furthermore, Israel's occupation of the Golan Heights meant an end to Arab efforts to divert the headwaters of the Jordan.<sup>4</sup> Israel's 1982 invasion of Lebanon and its occupation of a "security zone" in southern

Lebanon put her temporarily in the position of controlling the Litani and the Awali. Following a partial withdrawal, Israel still controlled the lower Litani and the Awali.

Israel draws more than 660 mcm per year from the Jordan and an additional 200-300 mcm from Lake Tiberias. Interference with the flow of the Jordan or its sources is not tolerated. Israel destroyed the early stages of construction of the Mukhieba dam on the Yarmuk River rather than allow the amount of water entering the Yarmuk Triangle to be diminished.<sup>5</sup> Jordan is also prevented from clearing the entranceway where the waters of the Yarmuk enter the East Ghor Canal, although this is more of a political than a hydrological exercise. Interference with the East Ghor is one means of putting political and economic pressure on Jordan and thereby emphasizing Israeli dominance.

Israeli policies also prevent the Palestinians from utilizing their fair share of the waters of the West Bank. They accomplish this by several measures. The drilling of wells by Palestinians without Israeli permission is prohibited and, even when Arabs are permitted to drill wells, the Israelis closely supervise these operations. Limits are placed on pumping from existing Arab wells and these wells are metered. Palestinians pay more than Jews

for the water which they are permitted. Palestinians are prohibited from farming after 4:00 p.m. and they are not allowed to grow certain crops. Meanwhile, Israeli settlers are provided water at subsidized prices. Finally, all water needed for Israeli settlements in the West Bank is drawn from West Bank sources.<sup>6, 7</sup>

Despite Israeli policies, all of the Arab riparians are not critically affected by loss of Jordan basin waters. Both Syria and Lebanon have substantial water resources outside the Jordan basin. Regardless of what the future holds for the Jordan, Syria has water enough for domestic and municipal uses, irrigation, and, if disputes with Turkey over Euphrates river waters can be resolved, Syria will have enough water for power generation. Lebanon will also have sufficient resources if the Israelis do not interfere with the flow of the Litani. Loss of all or part of the Litani to Israel would have a critical impact especially on power generation and irrigation in southern Lebanon. According to Halawani, Israel has plans to divert 400 mcm from the Litani at al-Khardale to Israel. This would be in accord with the Cotton plan. Halawani claims that this is technically feasible.<sup>8</sup>

Israel denies any intention of diverting the flow of

the Litani because, if for no other reason, such a diversion would be impractical. Present Lebanese diversion of Litani waters to the Awali leaves only 100 mcm in the lower Litani. Such a sum would not be worth the political cost of diversion, but if the Israelis could halt the diversion of water by the Lebanese to the Awali by controlling or destroying the Qir'awn Dam and the Markaba Tunnel, they could control 650 mcm instead of 100 mcm.<sup>9</sup> Of the two options, destruction of the dam and the tunnel would be less costly militarily and probably less costly politically.

Jordan would face the most serious consequences, by far, if Israeli control of the Jordan and domination of the Yarmuk becomes permanent. According to the Johnston Plan, Jordan was to have received 52% of the Jordan River waters; Israel, 36%; Syria, 7%, and Lebanon, 3%. This was based on an estimated total volume of water of 1,380 mcm per year.<sup>10</sup> Currently, Jordan's only access to the Jordan River waters is to the lower stem which forms the border between Jordan and the Israeli-occupied West Bank. The flow here has been greatly diminished by Israeli withdrawals upstream. According to Lowi, "In the 1950s . . . the Jordan delivered about 1800 mcm . . . of water into the Dead Sea, on an annual basis. Today, it

discharges an average of about 210 mcm."<sup>11</sup> In addition, these waters are too saline to be of any use. Salinity is worsened by Israeli diversions of saline waters away from Lake Tiberias into the lower stem of the Jordan.

The burden on Jordan of the loss of water resources to Israel is immense. According to Saleh,

" . . . irrigated agriculture represents approximately 8 per cent of the cultivated land, but it produces more than 40 per cent of the total agricultural production, about 70 percent of the gross value of agricultural production, and about 85 per cent of agricultural exports."<sup>12</sup>

Unless measures can be taken to provide Jordan with an adequate water supply, Jordanian agriculture is headed for disaster and the Jordanian economy with it.

#### The Johnston Plan

It would be appropriate to discuss in some detail one earlier proposal which came close to gaining acceptance by the Jordan riparians. This was the Johnston or Unified Plan.

This plan was the result of deep United States government involvement in the mid-1950s in attempting to bring about a settlement which called for joint development and administration of the Jordan. The Johnston Plan would distribute the estimated average of

1,380 mcm per year as follows: Israel, 36 percent; Jordan, 52 percent; Syria, 7 percent, and Lebanon, 3 percent.<sup>13</sup> These figures are only approximations. The specific agreement called for Jordan to withdraw 720 mcm per year; Lebanon, 35 mcm; Syria, 132 mcm, and Israel, the remainder.

This plan would have included the waters of the Yarmuk, but not the Litani. Since the actual amount of flow would vary from year to year, so would the amount remaining for Israel. However, since Israel took her share from the remainder, it was free to use its allocation in or out of the basin.

An upper Yarmuk dam was included which would provide a storage capacity of 300 mcm and produce 150 million kilowatt hours of electricity. The Yarmuk's flood waters which averaged 80 mcm annually would be stored in Lake Tiberias for Jordan's use. A canal would be constructed from Lake Tiberias to Adasiya on the Yarmuk to transfer 100 mcm from the upper Jordan. A feasibility study would be conducted for a dam on the Hasbani to provide water to Lebanon.

According to Doherty, "two fundamental issues remained: water allocation and the question of international supervision."<sup>14</sup> Under this plan Israel

would receive an average of about 400 mcm, but it wanted 550 mcm. Furthermore, "Israel refused supervision by an international body, preferring direct supervision by the states concerned, or at most, supervision by a small 'agreed impartial body of water engineers.'"15 This was in part due to a desire on Israel's part for at least implicit recognition by its neighbors. It is worth noting that Israel now has that implicit recognition as a result of the ongoing Arab-Israeli peace talks which began in 1991 under the joint sponsorship of the United States and the Soviet Union. That could bode well for a basin-wide agreement similar to the Unified Plan.

At least one author, Wishart, maintains that in 1956 "there existed no compelling reason for the Arab states to participate in a joint water project with Israel."16 Population pressures and agricultural needs were not the critical matters in 1956 that they are in 1992. Jordanian government officials felt that the plan was for the benefit of Israel and that Jordan was better off without it.17 Obviously, the situation has changed.

For an overview of other plans which have been proposed for development of the Jordan basin, see Naff and Matson's Water in the Middle East - Conflict or Cooperation or Doherty's Jordan Waters Conflict.

Table 4.1

"DEVELOPMENT SCHEMES FOR JORDAN RIVER SYSTEM

<u>Year</u>	<u>Plan</u>	<u>Sponsor</u>
1913	Franghia Plan	Ottoman Empire
1922	Mavromatis Plan	Great Britain
1928	Henriques Report	Great Britain
1935	Palestine Land Development Company	World Zionist Organization
1939	Ionides Survey	Transjordan
1944	Lowdermilk Plan	U.S.A.
1946	Survey of Palestine	Anglo-American Committee of Inquiry
1948	Hays-Savage Plan	World Zionist Organization
1950	MacDonald Report	Jordan
1951	All Israel Plan	Israel
1952	Bunger Plan	Jordan/U.S.A.
1953	Main Plan	UNRWA
1953	Israeli Seven-Year Plan	Israel
1954	Cotton Plan	Israel
1954	Arab Plan	Arab League Technical Committee
1955	Baker-Harza Plan	Jordan
1955	Unified (Johnston) Plan	U.S.A.
1956	Israeli Ten-Year Plan	Israel
1956	Israeli National Water Plan	Israel
1957	Greater Yarmuk Project (East Ghor Canal)	Jordan
1964	Jordan Headwaters Diversion	Arab League"

Source: Naff and Matson.



Table 4.2

Distribution of Water under Various Plans

"MCM of water  
per year

	Main Plan	Arab Plan	Cotton Plan	Unified Plan
Israel	394	182	1,290	remainder after co-riparian withdrawals
Jordan	774	698	575	720
Lebanon	-	35	450.7	35
Syria	45	132	30	132
Total	1,213	1,047	2,345.7	-"

Source: Doherty.

Technical Aspects and Development of  
of Additional Water Sources

Satellite Data

In his paper "The Role of Geographic Information Systems (GIS) Technology in the Future Management of Middle Eastern Rivers," John Kolars points out that such satellites as Seasat, Geosat, and ERS-1 "have already, through the use of radar altimeters, provided previously unobtainable data relating to water levels . . . "18 More information and more detailed information will become

available "beginning in 1998 with the orbiting of EOS-A, the first satellite of the next generation" of Earth Observation (EO) satellites.<sup>19</sup> These advances will provide international and basin-wide water commissions with the data needed to ensure equitable distribution of shared waters and to detect and prevent cheating by various riparians.

#### Peace Pipeline

Additional water resources are available in the region. The proposed Peace Pipeline from Turkey "would carry more than 6 million cubic meters of . . . water daily through Syria, Iraq, and Jordan onto the parched sands of the Saudi and Gulf-state deserts."<sup>20</sup> If even a portion of this water could be utilized in the Jordan basin, it would have a tremendous impact on the water needs of the basin. One-third of this amount would be the equivalent of another Litani. However, if the Gulf states are paying for this pipeline, it is unlikely that they would allow that much of the water to be diverted.

Unfortunately, the full Peace Pipeline scheme has a number of flaws. It is expected to be inordinately expensive so much so that the Gulf states would be better off continuing to pursue desalination. The quantity of

water, just over 2,000 mcm per year, would not justify the expense. Assuming that the states whose territory the pipeline would cross would want a share of the water, the quantity reaching the Gulf would be even less. Finally, the pipeline would be a tempting and vulnerable target for anyone wishing to attack the interests of the Gulf states.

Kolars has also proposed a "mini-Peace Pipeline" from Turkey to Jordan which is more to the point of this paper. According to Kolars, this plan

" . . . would have the effect of relieving Jordan's nearly unbearable water shortage, and . . . might bring water to the West Bank Arabs, thus obviating . . . conservative Israelis' argument that land cannot be given up for peace because land means the control of the sources of non-negotiable water supplies."<sup>21</sup>

This plan has the advantages of being less expensive (although the Gulf states would probably be no longer willing to put up the money), more secure since the pipeline would be shorter and all the states involved would presumably have a share in safeguarding it, and more worthwhile since the quantity of water would have a tremendous impact on the hydrological status of the Jordan riparians.

In addition to the Peace Pipeline, there are other possibilities for increasing the water resources of the basin. All of these, however, have their own flaws.

In a 1985 article in Scientific American, Arie Issar describes a nonrenewable aquifer located under the Sinai and the Negev which "holds 200 billion cubic meters of water, 70 billion of which is under the Negev."<sup>22</sup> Water from this source is already being used in Israeli agriculture. According to Issar,

"At present 25 million cubic meters per year of the Nubian sandstone water is being used for industrial and agricultural purposes by Israel. Israeli engineers and hydrogeologists are investigating the feasibility of driving galleries into the sandstone layers in order to pump 300 million cubic meters of water per year in the coming century. They dream of turning the Arava rift valley into a densely populated agricultural region. Preliminary studies give encouraging results and research continues in that direction."<sup>23</sup>

The obvious problem with this source is that it is nonrenewable although, if this amount of water could be exploited, it could have a major impact for the foreseeable future. Another problem is that exploitation of this source could lead to problems with Egypt since the aquifer may cross into the Sinai. Probably the biggest problem is that much of the water may not be recoverable as a practical matter due to depth and expense.

In the long run, the great hope for meeting the rising demand for water in the basin rests with desalination. Improved techniques resulting in reduced fuel requirements

give the hope of desalination as a cost effective means of providing additional water for arid regions. Israel developed its first desalination plant in 1965 for Eilat.

The countries of the Persian Gulf have followed suit. A number of methods are in use and experiments are being conducted with other methods, but desalination remains an expensive process which only energy rich countries can afford as a major source of fresh water.

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## Chapter 5

### Key Terms

In order to deal with the issue of water-related conflict, it is necessary to carefully define the key terms which relate to this actual or potential conflict: militarization of water, strategic importance of water, and hydro-security balance.

The militarization of water in its simplest form means that control of water resources is an issue which can, as an individual issue or in combination with other issues, lead states to engage in the threat of or the actual resort to armed conflict. This assumes that protection of a state's water resources or the seizure of a neighboring state's water resources is a constant factor in military planning.

According to Clausewitz, "War is nothing but a duel on an extensive scale . . . War therefore is an act of violence intended to compel our opponent to fulfill our will. . . the compulsory submission of the enemy to our will is the ultimate *object*."<sup>1</sup>

If this is true, then all five major actors of the Jordan basin can be said to have been at war over water for decades. Specific military actions directly or indirectly involving water include al-Assifa's first



military action against Israel - an unsuccessful attack against the Israeli National Water Carrier on December 31, 1964.<sup>2</sup> The 1967 war was partly a result of Syria's attempted diversion of the Jordan River headwaters which in turn was a result of Arab efforts to block the completion of the Israeli National Water Carrier.<sup>3, 4</sup> In 1982, Israel captured the lower Litani during its invasion of south Lebanon.<sup>5</sup> However, there is no conclusive proof that control of the Litani was a factor in the Israeli invasion. Israel currently uses military force to prevent Jordan from clearing the entrance from the Yarmuk to the East Ghor canal thereby preventing Jordan from utilizing available water supplies. Israel's military occupation has given it - and not the Palestinians - control of the aquifers of the West Bank.<sup>6</sup>

Israel has indeed forced the other riparians to submit to its will concerning control and use of water resources. The hydrological implications for Syria and Lebanon are not of overwhelming proportions, but the implications for Jordan and the Palestinians are tremendous. Neither the Jordanians nor the Palestinians have the industrial potential that Israel has although they both have well educated, skilled workers. Israel has a great advantage due to both government and private aid from the United

States. They do not have to deal with a military occupation of their territory as the Palestinians do nor because of their military strength do they have to tolerate foreign interference with their water supplies as both the Jordanians and the Palestinians do.

Since agriculture is a major component of their economy by necessity (unlike the Israeli situation where agriculture is important by choice), the Jordanians and the Palestinians suffer economic hardship due to Israeli diversion and control of water. The implications for Palestine are unclear, but the implications for Jordan are economic instability and the potential for political instability.

The strategic importance of water is that water is one of the very few resources which a state must have not only to flourish, but to even survive. Unlike energy resources or most raw materials there can be no substitute for water. Since river use of the Jordan and the Yarmuk is sequential, Jordan is effectively at the mercy of its co-riparians. If a nation is to grow and prosper, then the water supply must 1) already exceed future requirements or 2) grow with the population and the economy of the nation. Jordan's water supply is neither adequate nor is it growing.

In a region which is largely arid the strategic importance of water cannot be overemphasized. With rapidly growing populations and overuse of the available water supplies of the Jordan basin, any country which cannot secure its required water supplies is doomed to a steadily and perhaps rapidly declining standard of living with all the attendant social and political pressures. Unless steps can be taken now to develop new sources of water or to control demand, conflict over limited resources seems inevitable.

This is not just an Arab-Israeli problem or a Jordan basin problem. Jordan and an independent Palestine may clash over the waters of the Jordan or the Yarmuk. Turkey and Syria may clash over the Euphrates. Jordan and Syria have the potential for conflict over the Yarmuk. Plans for the joint construction of al-Wahdah dam on the Yarmuk may ultimately be overshadowed by Syrian plans to divert water on the upper Yarmuk threatening a key element in Jordan's economic future. Even if this potential crisis is avoided, there is still the Israeli threat with which to contend. Israel considers the Yarmuk an important source of its water drawing 100 mcm of its waters annually.

The same uncompromising attitude is exhibited towards

the waters of the West Bank. Israel considers the aquifers located there as essential having already reached and exceeded full utilization of its overall water resources. However, the Palestinians with an economy heavily tied to agriculture cannot afford to acquiesce in Israeli control of this vital resource.

The third key term is hydro-security balance. The hydro-security balance may be defined as the state which exists when a nation has the water resources or the reasonable expectation of developing the water resources necessary to keep pace with population growth and minimum standards of economic growth. While this will involve military security as a means of protecting existing resources, it is no longer sufficient to speak of security in military terms only.

Several authors have redefined security in other than strictly military terms. According to Lester R. Brown, the director of the Worldwatch Institute and the author of numerous works on population and world hunger:

"... the military's role in securing a nation's well-being and survival is relatively less important than it once was. At the same time, protecting and securing the future of a nation by strengthening international cooperation, developing alternative energy sources, and producing adequate food supplies are escalating in importance."

Be that as it may military security is still the major

determinant of national security. As another authority on security, Jessica Tuchman Mathews, points out "Environmental decline occasionally leads directly to conflict, especially when scarce water resources must be shared."<sup>8</sup>

Concerning hydro-security, the absence of both military security and international cooperation in protecting vital resources mean a complete lack of hydro-security of which the Arab riparians of the Jordan basin are currently an excellent example. Since none of the Arab riparians have the military strength to end Israeli control of the waters of the Jordan basin and there exists no agreement among the various riparians to safeguard Arab interests, the Arab riparians have no option but to tolerate water shortage.

## Endnotes, Chapter 5

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## Chapter 6

### Possibilities for Change: Incentives and Pressures

Due to Israeli strength and Arab weakness, the only possibility for a change in the status quo is for some state or some combination of states to induce or pressure Israel into reaching an equitable division of the waters of the Jordan basin with the Arab riparians.

There are strong incentives for Israel to favor the status quo with regard to the Jordan. According to Cooley,

"Israeli planners privately admit that unless the country concentrates purely on expensive desalination plants, or finds a way to increase substantially the present recycling of used irrigation and waste water, present aquifers can scarcely meet the country's current needs or greater levels of consumption much beyond 1990. Another major water source will be needed. The hydraulic imperative, from the Israeli point of view, is capturing either the Litani or a much greater share of the Yarmuk."<sup>1</sup>

Another incentive favoring the status quo is the rising population of Israel. According to the Statistical Abstract of Israel 1991, the population of Israel as of 1990 was 4,821,700, the West Bank was 955,000, and Gaza was 642,000.<sup>2</sup>

With rising demand and limited supplies of water available, Israel must be given strong incentives to change her current policies and to share the waters of the

Jordan with the other riparians.

Currently the biggest user of water resources in Israel is agriculture. The most basic incentive for Israel to at least change her water allocation policies (though not to share what water she controls) is that water for large scale commercial agriculture will simply not be available in the long run. Beaumont estimates that by the year 2000, "at least 500 million cubic m annually will have to be obtained from other sources, including re-use of water or the creation of fresh water by desalination techniques."<sup>3</sup> Reduction in the amount of water provided for agriculture, down in Israel from 1,236 mcm in 1989 to 1,162 mcm in 1990,<sup>4</sup> is one way in which the growing demand for water in the country can be greatly reduced. At some point, the importance of agriculture in Zionist ideology will very likely make further reductions impossible. Nevertheless, any reduction in the demand for water in Israel, however minor or temporary, may help contribute to an eventual solution to the crisis of the Jordan basin.

One of the few legitimate incentives for Israel to share any of the water of the Jordan basin which she so thoroughly dominates is in the diplomatic arena. With the United States-Russia sponsored peace talks in progress



and, at least for the moment, United States loan guarantees to Israel for resettlement of Russian Jews, a total of \$10 billion, being held up due to a dispute between the United States and Israel over Jewish settlements in the Occupied Territories, it would be in Israel's interests to make a positive gesture.

One possibility might be to allow construction of a "by-pass" from the banks of Lake Tiberias to the Dead Sea. This would remove a source of highly saline water from the lower stem of the Jordan without further decreasing the flow of water into the Dead Sea. The resulting improvement in the quality of the water of the lower stem of the Jordan could, if Israel were willing, provide an additional source of water to Jordan without reducing Israel's current water supplies. Israel could use the water itself, but it would miss a painless opportunity to improve its strained relations with the United States.

While there are few incentives for Israel to share the waters of the Jordan, there are several potential pressures which could be brought to bear to change Israeli policy.

Politically and diplomatically, the most obvious would be pressure to include the water issue as part of a comprehensive peace settlement. With the United States

and Russia sponsoring the current Arab-Israeli peace talks (which began in 1991), each has a stake in a successful outcome. The results can only be successful if all issues have been given a thorough review. Concluding a peace treaty which left Jordan, south Lebanon, and a possibly independent Palestinian state economically unviable would be unacceptable to the Arab states and, presumably, to the major powers which sponsored the talks.

A further political incentive for Israel to change, perhaps one of the strongest incentives, is concern for instability in Jordan and the effect this would have on the Palestinians of the Occupied Territories and the Arabs of Israel. The obvious flaw with this argument is that there is no guarantee that Jordan will not become radicalized upon the death of King Hussein in any case.

Economically, the obvious way to apply pressure would be for the United States to threaten reduction or elimination of aid to Israel. Frankly, the possibility of eliminating aid to Israel is all but nonexistent. Furthermore, the reduction or the freezing of United States aid to Israel for any length of time is also unlikely. Given the example of the current dispute over loan guarantees, however, the threat of such a reduction would have greater weight. Whether it would have

sufficient weight would depend in great part on how much the current administration was willing to bring its prestige to bear on the issue. Due to the importance of the United States to Israel financially, just the public discussion of a possible reduction in American aid to Israel could have a significant impact.

One major flaw with this effort would be that, to many Americans, Jordan and Palestine, who would be the major beneficiaries of this effort, were viewed as being pro-Iraqi during the Persian Gulf War, while Israel is still viewed as a strong ally of the United States. This negative perception of the Jordanians and the Palestinians as well as this positive perception of the Israelis is subject to change over time, however.

A further economic argument is that Israel will need additional U.S. aid to improve her water status regardless of what happens with the waters of the Jordan. Expansion of water reclamation projects and additional desalination plants will require large expenditures of money. In addition, Israel has close economic ties with Europe which the Israelis want to further advance and a number of European states are sympathetic to the Palestinian cause. (Fifty-four percent of Israeli imports come from Europe, while forty-two percent of Israeli exports go to Europe.<sup>5</sup>)

Questions remain: Does Israel have to make any kind of gesture on the water issue in order to obtain American and European aid? If not, she could have the desalinated water and the Jordan's water as well. If so, would the gain of of water by these technical means more than make up for the loss of water to Jordan or the other riparians? Unless the United States is willing to apply financial pressure, it is unlikely that Israel will give up any of its water resources. If it did, however, it would go a long way towards repairing U.S.-Israeli ties and would give Israel a much needed boost in world opinion.

Demographically, the pressure for Israel to compromise on this issue is tied to the peace process. Would Israel give the Palestinians an independent state as well as the water to make it viable? Would it give them a state without adequate water resources? If it does neither, how can it possibly manage a large Palestinian population which is growing faster than the Jewish population - with settlers' guns and military courts?

According to Benvenisti, "All other things being equal, by the year 2010 Jewish and Arab populations will attain parity."<sup>6</sup> The influx of Soviet Jews notwithstanding, the Palestinian population will eventually equal and then surpass the Jewish population.

This assumes there will not be a mass deportation of the Palestinian population to Jordan or to some other Arab state - something which is not a foregone conclusion. It is therefore in Israel's interest to conclude a peace treaty which does not leave a potential Palestinian majority within Israel's borders. This does not mean that if the Palestinians are given their own state, they will be given control of its waters.

However, a Palestinian state without control over its own waters would be economically unstable and, because such a new state would be in the process of establishing national political institutions, it would be even more unstable politically. The implication is radicalization of the new state and almost certain conflict with Israel.

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Table 6.1

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#### POPULATION PROJECTIONS FOR THE WEST BANK AND GAZA

"Three alternative assumptions have been introduced.

1. Zero annual migration balance (i.e. no emigration)
2. Negative annual migration balance, equal to the rate in recent years, i.e. 8.0 per thousand for the West Bank and 6.5 per thousand for the Gaza Strip.
3. Negative annual migration of 10.0 per thousand for both areas.

PROJECTIONS TO 2002 OF THE POPULATIONS  
IN THE WEST BANK AND GAZA STRIP (BASE: 1985)

(thousands)

	<u>Gaza Strip</u>	<u>West Bank</u>	<u>Total</u>
End of 1985	526	813	1,339
Projections to 2002			
Projection 1	992	1,429	2,421
Projection 2	865	1,221	2,076
Projection 3	789	1,136	1,925"

Source: Benvenisti

Table 6.2  
POPULATION BY COUNTRY  
(THOUSANDS)

MIDDLE EAST

YEARS	ISRAEL	GAZA STRIP	WEST BANK	JORDAN	LEBANON	SYRIA
1986	4,146	543	948	2,653	3,310	10,744
1990	4,445	616	1,038	3,065	3,392	12,471
1995	4,801	721	1,166	3,676	3,669	15,068
2000	5,165	837	1,309	4,372	4,084	18,157
2005	5,544	968	1,463	5,117	4,534	21,732
2010	5,925	1,113	1,628	5,896	4,973	25,797
2015	6,302	1,272	1,802	6,722	5,386	30,365
2020	6,671	1,441	1,983	7,607	5,789	35,435"

Note: The figures for Israel excludes Non-Jewish  
population of East Jerusalem and Golan Heights

Source: Urban & Rose.

No one reason is sufficient for Israel to change its policy of dominance of the waters of the Jordan basin. The following issues taken in various combinations may provide a comprehensive reason for Israel to change.

Israel's primary need for water is to provide for the agricultural sector. However, agriculture as a percentage of the labor force in Israel fell from 6.4 percent in 1980 to 4.2 percent in 1990 and considering just Jewish workers the percentages fell from 5.4 percent to 3.9 percent.<sup>7</sup>

While Israel would be understandably reluctant for both economic and ideological reasons to undertake a reduction in agriculture, it might very well be to Israel's advantage to shift more and more resources from agriculture to light industry. Financially, the industrial sector is much more important to Israel's foreign trade than agriculture because agricultural exports have only grown from \$555,700,000 in 1980 to \$654,800,000 in 1990 while industrial exports have grown from \$4,955,500,000 in 1980 to \$11,060,000 in 1990.<sup>8</sup>

Furthermore, depending on the extent of such a shift, Israel could reduce and could conceivably eliminate its water deficit. A permanent 25 percent reduction in water for agriculture from current consumption would result in a reduction of 290 mcm annually. Even if water consumption

in industry was doubled from current levels, the net savings of water annually would be 184 mcm. If a serious plan would followed for further conversion of the economy from agriculture to light industry, much larger water savings could be realized. While this does not mean that Israel would automatically give up control of any of its water, it does mean that the pressures against doing so would be greatly reduced.

Since Israel has an educated work force, it could greatly expand its industrial output and dominate a peaceful Jordan basin economically by selling industrial output to its neighbors while obtaining agricultural produce from them. If it chose not to trust its neighbors to be regular suppliers for its agricultural needs, it would find no shortage of countries willing to sell these products. Israel currently imports \$421,700,000 worth of food including \$176,800,000 from the European Community; \$82,100,000 from the United States; \$43,400,000 from Argentina; \$29,600,000 from Uruguay; and \$10,500,000 from Turkey.<sup>9</sup>

A further incentive to reduce consumption of water is the deterioration of groundwater quality. According to Nativ, "Mean chloride concentrations in groundwater of the Coastal Plain aquifer has increased during the last 25 yr



from 100 to 155 mg/l (250 mg/l being the upper limit for drinking water). . . "10 A survey by Tahal shows that at the present rate of pumping, 450 wells with a total capacity of 100 mcm "will have to shut down because of the increase of chloride and nitrate concentrations in their water."11

Political and diplomatic reasons why Israel might allow its neighbors a greater share of the waters of the basin include the following. Any peace treaty, in order to be effective and acceptable, must allow the Arab riparians the opportunity to be economically viable. The impact of the distribution of the waters of the Jordan will not decisively affect Syria or Lebanon. The impact will of course be critical for both Jordan and Palestine. If Israel continues its current policy of domination, the economic, political, and social viability of both Jordan and Palestine will be in serious doubt. The resultant instability and its effects on the Arabs of Israel will pose long term threats to the security of Israel. These include increased unrest among Israeli Arabs, an increase in violence in the Intifada (the Palestinian uprising in the Occupied Territories), and quite possibly the overthrow of the monarchy in Jordan and its replacement with a radical regime.

The economic effects on Israel of a successful peace treaty of which a water settlement would be a key element would be an eventual lessening of defense outlays, open trade with its neighbors, increased tourist revenues, and the benefits which would accrue as a result of joint ventures (including hydrological ventures such as a Med-Dead canal or a Red-Dead canal which would consist of canals from either the Mediterranean Sea or the Red Sea to the Dead Sea taking advantage of the sharp drop in elevation to produce hydroelectric power). The other major, economic benefit could be an even more willing aid program from the United States.

Obviously, the role of the United States in any solution would be vital. Despite recent friction, the United States is still Israel's best hope for major power support. The United States has the capacity to push other major financial powers to provide economic support for both a comprehensive and a water related settlement. The United States is also the only power with an effective veto over such action. According to Cooley,

"Only the United States is in a position to persuade the regional states to return to the ideas of planned water sharing and joint water development as part of any really practical peace package.

"The United States should make it clear that it will not tolerate new military campaigns by Israel, or anyone else, to seize additional land or other resources."<sup>12</sup>

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## Chapter 7

### Solutions & Recommendations Construction of a Viable Model

The task is to construct a model for examining water related conflicts which can be applied throughout the Middle East. Any model must consider the two major factors individually and in combination: military power and water posture.

In considering military power, compare the relative strengths of the opposing forces including not just raw numbers of troops, but continuing the process with key elements of equipment and organization. As we have already seen, Israel has the advantage over the Arab riparians with a modern, mechanized ground force and a high performance air force.

In considering water posture, a number of items must be reviewed: What are the total developed water resources of the riparian? Are there undeveloped sources? Does the riparian border a sea or ocean where desalination plants may be constructed? In this particular case, all of the riparians have access to the sea so desalination is potentially available to them all.

What are the current water requirements of the riparian? Are these requirements being met? Water

requirements are being met for Syria and Lebanon, but not for Jordan and the Palestinians (due to Israeli interference) and not for Israel (due to insistence on maintaining an agricultural sector).

What is the projected population growth? All of the Arab riparians project high growth rates which in the case of Syria and Lebanon will not be a burden on the water resources, but which in the case of Jordan and the Palestinians will overburden an already grim situation. Israeli population growth is lower than that of the Arabs, but the expected influx of Soviet Jews will be a burden on the water supply if current utilization policies remain in effect.

What are the total anticipated requirements for the foreseeable future? Are resources adequate to meet these requirements? Will impact on standard of living be improvement, deterioration, or maintenance? Resources in Syria and Lebanon are adequate to meet anticipated demand, but Jordan and the Palestinians face a lower standard of living while, if there is no change in policy, Israel can be expected to seize an even higher share of West Bank water. A move against the Awali or the Litani also cannot be ruled out.

The next step in the process is based on the

assumption that a regional accommodation can be made which will be in the interests of all parties and which can satisfy the legitimate security concerns of each of the actors.

Can anticipated water requirements for each of the riparians be met? If so, no change is necessary. If not, compare military status of those riparians with anticipated shortfall with the military status of those with adequate or excess water resources. If military strength of the water-poor is inferior to that of the water-rich, expect continuing disparity or political and diplomatic maneuvering. A current example of this last situation is the status of Israel and Jordan. If military strength of the water-poor is superior to that of the water-rich, expect conflict or political and diplomatic maneuvering. A potential example of this situation could be the status of Israel and Lebanon.

Security needs which must be addressed include whether water resources are protected by military force or by treaty. If the water is protected by military force, is the military capable of accomplishing this mission? Israel has proven that it can defend its water development projects from attack specifically by Syria and by the Palestine Liberation Organization. Israel has also proven

that its Arab coriparians cannot defend their water.

Israel has at various times attacked or seized Arab water sources in Lebanon (the Litani and the Awali), Syria (the Jordan diversion project), Jordan (the Yarmuk and the East Ghor Canal), and Palestine (the West Bank aquifers).

The other option is to protect water resources by treaty. Do the coriparians have diplomatic agreements or even diplomatic relations? In the case of Israel and its Arab co-riparians, the answer is still officially no although the current peace talks do provide a forum for discussion.

In the absence of unilateral actions by the dominant riparian to correct the imbalance what is required is a treaty that is enforceable, practical, provides for management and distribution of waters through an acceptable agency, and which provides for development of additional water resources.

To be enforceable, the treaty must include penalties for violators. Some possibilities are a temporary reduction in water share, in the sharing of hydroelectric power, or by some other form of sanction.

To be practical, the treaty must meet the needs of all the signatories. Water and hydroelectricity must be available on an adequate basis for all riparians. Since



some riparians are more in need of power generation than water, this factor can be used to encourage cooperation. For example, Israel produced 3,980 kWh per capita in 1987 and Jordan produced 1,150. On the other hand, Lebanon produced 800 kWh per capita while Syria produced only 750.<sup>1</sup>

The following examples presuppose that a comprehensive peace settlement will be reached involving Israeli withdrawal from much, if not all, of the Occupied Territories. As part of a comprehensive agreement, Syria could agree to forfeit consumptive use of the Yarmuk or the headwaters of the Jordan in exchange for a larger share in the power produced by a Med-Dead or a Red-Dead Canal. Lebanon could agree to forfeit claim to consumptive use of the Baniyas and the Hasbani in exchange for a share of hydroelectric power and for security guarantees on the Awali and the Litani. Jordan and the Palestinians could give up most of their share of hydroelectric power in exchange for water for agriculture. Finally, Israel could give up a greater share of the waters of the Jordan and the West Bank aquifers in exchange for formal diplomatic recognition and for economic assistance from the United States and others to assist in moving toward a more industrialized and less

agricultural economy.

The key to fair and just management and distribution of basin water resources is the creation of a viable management council. This council, which will be discussed in more detail later, would be responsible for managing and monitoring the equitable distribution of the waters of the basin and also for the distribution of hydroelectric power from those development projects included in the settlement.

Finally, the agreement would provide for feasibility studies and, where possible, development of additional water projects such as the Peace Pipeline, the mini-Peace Pipeline, desalination projects, or development of the nonrenewable Negev aquifer.

In the past, United States efforts to bring about a settlement failed in large measure due to Arab insistence on and Israeli refusal of international controls over basin water. According to Cooley, "The Arab states insisted on an international board to supervise the allocation of regional water resources. Israel . . . rejected giving a board containing Arab members any control over Israeli water supplies."<sup>2</sup> However, other nations have managed to reach agreement on joint or international commissions to oversee shared water

resources with the United States and Mexico being an example. Conditions in the Jordan basin vary greatly of course from conditions in the Colorado and Rio Grande basins, but the basic concept is the same. Certainly, Mexico did not look forward to negotiations with a militarily superior upper riparian.

In discussions of the Johnston Plan, Israel's main objection to a commission controlling the waters of the basin was that such a commission would have Arab members who would then have at least partial control over a resource which is vital to Israel. The resource is, however, no less vital to the Arab riparians, particularly to Jordan and the Palestinians. If a formula could be determined for an equitable sharing of the water with the further incentive of developing additional sources by such means as a peace pipeline or large scale desalination, then some form of supervisory commission could be worked out. In the Johnston negotiations, Israel indicated that it might find "supervision by a small 'agreed' impartial body of water engineers' " acceptable.<sup>3</sup> This suggestion can be built into a workable body.

Possible solutions to the need for a viable management council for the waters of the basin may already exist in the organizational structure of the United Nations. The

Economic Commission for Western Asia (ECWA) was established in 1973 to

"initiate and participate in measures for facilitating concerted action for the economic reconstruction and development of Western Asia, for raising the level of economic activity in Western Asia and for maintaining and strengthening the economic relations of the countries of that area both among themselves and with other countries of the world".<sup>4</sup>

Israel is not currently a member of this commission, but that could easily be remedied.

Under the Economic Commission, a United Nations Development Advisory Team (UNDAT) could be formed. UNDATs are formed by the Secretary-General at the request of the General Assembly "to assist the developing countries through . . . continuing advisory services in . . . development planning, plan implementation, public administration and management."<sup>5</sup> Each UNDAT consists of a group of experts; they are based in a specific location and assist several countries at any given time.

The power and authority of the management council would have to be spelled out in any agreement, but would include as a minimum monitoring, measuring, and reporting of data to the Economic Commission, the United Nations, and the coriparians. Membership of the management council would also have to be determined as part of an agreement, but possible options include limiting the membership

to neutral United Nations experts, to representatives of the riparians only, or to a combination of the two. The membership could be expanded depending on future developments. For example, if the mini-Peace Pipeline were to be built, then a Turkish representative would be a definite possibility.

Distribution of waters and of hydroelectric power would have to be included in the initial agreement. Factors impacting on the distribution formula would include availability of water and electricity from other sources, population, and level of economic development.

A scale of priorities would need to be included for future development including domestic and municipal use, agriculture, and power and industrial usage.

To make the proposal acceptable to all the riparians, but especially to Israel and Syria, funding for a number of projects would have to be provided by some combination of the United States, the European Community, and the World Bank. These projects include desalination plants for any or all of the riparians, an increase in use of drip agriculture for the Arab riparians in an effort to promote conservation of basin water, and funds for restructuring economies in the basin, especially Israel, away from agriculture and towards industry and services.

Major projects which would require a great deal of funding if the decision was made to pursue them include the mini-Peace Pipeline and the Med-Dead or the Red-Dead Canal.

Sources of agricultural produce to make up for Israel's move from agriculture would be needed and could include many of Israel's present food providers: the United States, the European Community, Argentina, Uruguay, and Turkey.

Another important question must be address. What if someone cheats? Possible sanctions have already been discussed, but the best solution to this problem is careful monitoring and rapid reporting. The management council will presumably have under its supervision a number of trained observers. In addition, the council could and should be provided with satellite data which can determine who is cheating and by how much. Sharing this information with all parties immediately should help to minimize if not eliminate cheating.

## Conclusion

### Long-Term Implications of Changing or Not Changing Policies

In the end, settlement of this issue comes down to the three riparians most closely tied to the Jordan basin:

Jordan, the Palestinians, and Israel. Syria and Lebanon have a role to play in a comprehensive settlement of the conflict over basin water, but, if necessary, a viable settlement can be reached without them. What are the implications for Jordanians, Palestinians, and Israelis if the status quo remains in place?

For Jordan, water shortage of critical proportions can only further damage an already weak economy. Economic instability will lead to political unrest and possibly to political instability. The collapse of the Jordanian monarchy cannot be ruled out and it would almost certainly lead to a more radical government. The Palestinian majority could transform Jordan into the Palestinian state which Israeli hardliners claim it is now. With King Hussein gone, the potential for conflict with Israel would increase.

For the Palestinians, the lack of a settlement of the water issue in the Jordan basin means a steadily declining standard of living as population increases and the water supply remains fixed or even decreases. The continuation of a political and military struggle in which the opponent holds all the advantages can only end in heartbreak for the people of the West Bank and Gaza.

For Israel, maintenance of the status quo means

maintenance of a "bunker mentality." With 875,000 non-Jews in Israel proper, instability in Jordan or the Occupied Territories will inevitably spill over into Israel with tragic results. The price for maintaining an agricultural segment which produces more hatred than crops will be continuously high defense expenditures, constant political and diplomatic tension, and certain military conflict which will be as costly in lives as it is unnecessary.

"For Israel, no military victory can solve the essence of its problem, no field success can assure its right to existence. For the Arabs, any defeat is a nonvictory for the Israelis . . . "6



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## Appendix A: List of Units Used

(From Naff and Matson, Water in the Middle East)

### Land Area:

ha = hectare =  $10,000 \text{ m}^2$  = 2.47 acres  
dunum = 0.1 hectare = 0.247 acres

### Electricity:

kwh = kilowatt hours

### Water:

MCM = million cubic meters (measure of volume)  
MCM/yr = million cubic meters per year or other unit of  
time (measure of flow)  
 $\text{m}^3/\text{sec}$  = cubic meters per second (or hour)  
(measure of flow)  
ppm = parts per million (measure of salinity)

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